VOL 8(2), 257-265
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ISSN: 2523-1901 (Online)
URL: http://jessd.mwu.edu.et/
Email: JESSDeditorials@mwu.edu.et
Journal of Equity in Sciences & Sustainable Development
DOI: https: //doi.org/10.20372/mwu.jessd.2025.1587

Policy Briefing

Improving Agricultural Productivity through Community-Led Integrated Natural Resource Conservation Approaches

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Article Info

Article History
Received: 10 June 2025
Accepted: 29 July 2025

Keywords:
Climate resilience, Community-led conservation, Land degradation, Smallholder farmers, Sustainable agriculture

Excutive Summary

Land degradation and climate variability threaten agricultural productivity in Ethiopia's highland and drought-prone areas. To ensure a long-term agricultural productivity, a novel approach is needed, emphasizing on the integration of natural resources conservation with agricultural production. Thus, Madda Walabu University implemented a community-led integrated natural resource conservation approach to restore degraded land and support smallholder farmers of the Goro district. This approach aims at integrating the physical, biological, and community-led conservation efforts to restore degraded lands and strengthen the resilience of smallholder farmers in the district. Through activities such as building soil and water conservation structures, planting fast-growing multipurpose grasses, and preserving indigenous plants, the project has achieved notable successes. These include better vegetation cover, improved soil fertility, and higher crop yields, along with stronger community engagement and ownership. Thus, this policy brief is intended to outline key lessons from the project and present pragmatic, evidence-based recommendations for scaling up successful practices. It calls for integrating locally-led conservation approaches into national strategies like Ethiopia's Climate Resilient Green Economy (CRGE) and Green Legacy Initiatives to promote land restoration, sustainable agriculture, and climate resilience in the country.

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1. Introduction

Climate changes and land use land cover (LULC) are the two inseparable linked global environmental challenges that the world is facing today (IPCC, 2019; Mustafa Abdule et al., 2023). Different human activities (anthropogenic factors) are directly or indirectly affecting the LULC (Berberoglu et al., 2020; Hu & Gao, 2020). Land degradation, driven by the combined impacts of

LULC and climate change, is one of the most serious challenges affecting the Sub-Saharan African countries including Ethiopia (Bhavya & Kasturappa, 2023; Slayi et al., 2024). The interplay effects of these two drivers have significant effects on the hydrological responses, sedimentation processes, soil erosion, agriculture, food security, and ecosystems as a whole (Zhang, et al., 2018; Belay & Mengistu, 2021). In Ethiopia, the situation is alarming, and about 75% of the country's land is believed to be moderately to severely degraded due to soil erosion, which is the cause for the loss of essential soil nutrients, and the decline of natural vegetation, all of which make it harder for communities to sustain their farms and livelihoods (Hurni et al., 2015; UNCCD, 2017). These challenges are pressing in the Goro district of southeast Ethiopia. Practices such as uncontrolled hillside farming, overgrazing, widespread clearing of vegetation, and a lack of proper soil conservation measures have led to soil fertility decline and water scarcity. This has induced significant decline in crop yield which has further exposed smallholder farmers to the impacts of climate change such as unpredictable rainfall and prolonged droughts, as well as worsening effects of soil degradation (Amsalu & de Graaff, 2007).

Recognizing the critical need for intervention, a community-led integrated natural resource conservation Mega project has been initiated by Madda Walabu University in Tilo sub-watershed, Goro district, Bale zone, Ethiopia (Figure 1). One of the major goals of the project was promoting land rehabilitation, enhancing agricultural productivity and community resilience there by supporting the national goal of ensuring food security. The project combines physical soil and water conservation practices, hillside terracing, level and stoned-faced soil bunds on farm and gully rehabilitation (stone, gabion, and brush-woods check dams) with biological interventions through the planting of multi-purpose grasses like vetiver (*Vetiveria zizanioides*), Desho (*Pennisetum pedicellatum*) and native plant species (*Aloe* species, *Cordia africana*, *Hagenia abyysinica* and others) in the project site. The approach is supplemented by community-based natural resource conservation that emphasizes inclusive participatory decision-making, indigenous knowledge, and ownership of conservation activities by the community. It involved workshops, capacity building, hands-on training, and cost-sharing to ensure local engagement and responsibility. Indigenous knowledge guided the identification of land degradation indicators and land use practices, while local bylaws and institutions supported implementation. Community ownership was fostered through the formation of management committees, integration with local governance structures, and formal handover of conservation sites, ensuring sustainability and long-term stewardship. The approach is informed by globally accepted best practices on sustainable land management by the Food and Agricultural Organization (FAO) and the World Overview of Conservation Approaches and Technologies (WOCAT) that are aligned with ecosystem-based approaches and integrated watershed management in halting land degradation and climate vulnerability (Asiva Noor Rachmayani, 2015).

The project's approaches, best practices, and achievements so far could be used as a springboard to the development and enrichment of policy frameworks on mountain rehabilitation, soil, water and, indigenous species conservation, climate-resilient agriculture, and long-term food security. With this view, this policy brief highlights key policy implications based on those achievements and urges both governmental and non-governmental organizations to invest in ecosystem restoration. It also supplements the development of sustainable policies that reflect the unique ecological and socio-economic aspects of integrated approaches and underscores the importance of implementing strong conservation and rehabilitation strategies to restore ecosystem functionality, build resilience, boost productivity, and support sustainable development. The primary objective of the project was to promote community-led, integrated natural resource conservation through the implementation of hillside terracing and soil bunds, complemented by biological interventions to enhance watershed management and ensure the long-term sustainability of agricultural productivity among small-scale farmers in the target area. Moreover, the policy brief is aimed at promoting sustainable agricultural productivity and climate resilience by scaling up community-led integrated natural resource conservation approaches that restore degraded lands, empower local communities.

Telo watershed spans from midland (woina dega) to highland (dega) agroecological zones, characterized by diverse microclimates that affect vegetation cover and cropping systems. Elevation of the area ranges from approximately 1,800 to over 2,900 meters above sea level, creating steep slopes and varying topography that accelerate erosion, particularly on degraded hillsides. The dominant soil types are Nitisols and Cambisols that is vulnerable to erosion. The area receives a relatively higher rainfall that intensifies runoff and necessitating conservation strategies like terraces, check dams, and agroforestry.

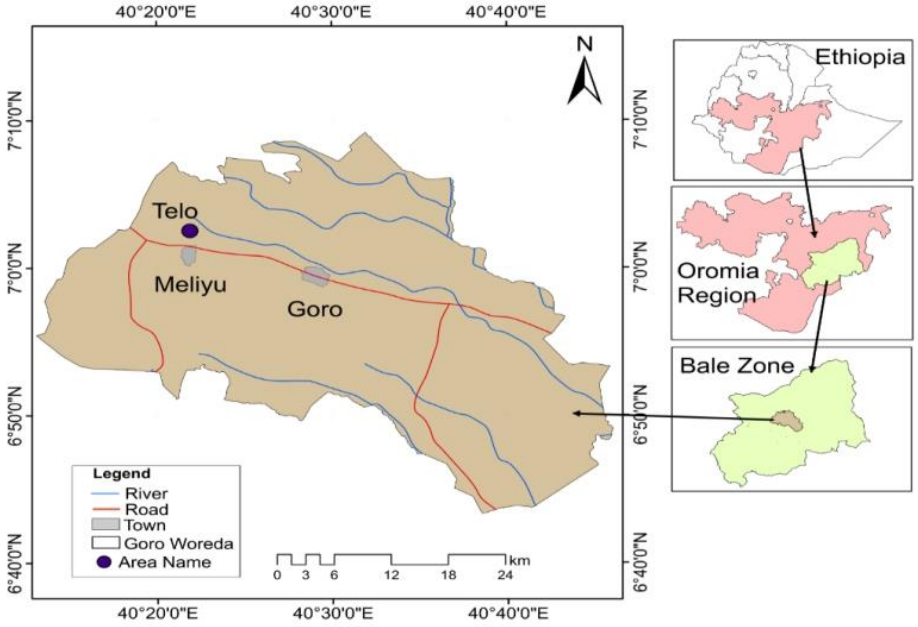

Figure 1a: A map showing the project site (Telo sub-water shade) in Meliyu, Goro district, Ethiopia

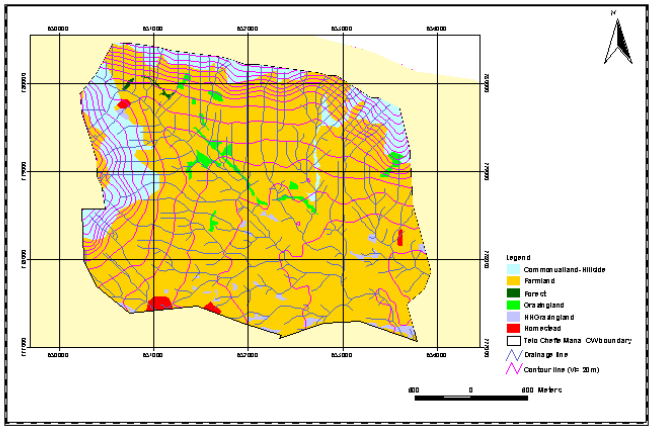

Figure 1b: Telo micro-watershade (the specific project area)

Key Messages:

This project demonstrates how community-led, integrated natural resource conservation contributes to national priorities, including land restoration, climate resilience, and the enhancement of agricultural productivity.

Engaging local communities and integrating their indigenous ecological knowledge with modern approaches, as well as the physical and biological conservation practices are essential for sustainable natural resource conservation and management.

2. Key Activities Undertaken

The project employed a multifaceted and basic strategy in landscape restoration that coupled physical and biological conservation measures. The physical conservation measures undertaken include hillside terracing along the entire Telo micro-watershed, construction of level and stoned-faced soil bunds on the lower banks of farmland and gully rehabilitation (stone, gabion, and brush-woods check dams). All these activities were undertaken to minimize runoff, reduce erosion, and improve water retention. To assure sustainability and efficiency of those physical activities, biological intervention using Vetiver (*Vetiveria zizanioides*) and Desho (*Pennisetum pedicellatum*) grasses were utilized. The coupled activities so far enhanced soil structure, increase organic matter, and accelerate regeneration as evidenced by soil and microbial load assessments before and after intervention. Using grasses as a biological intervention mechanism is one of the newly emerging and successful approaches to improve soil fertility within a short period of time beyond minimizing runoff and improving water percolation and hence facilitate the regeneration of soil seed bank, the survival and growth of tree seedlings. Besides, the identification, collection, and cultivation of indigenous medicinal plant species has been conducted. These activities are key in promoting biological intervention as a conservation approach and at the same time help to conserve biodiversity and sustain traditional health systems of the society. The approach in one way or another assures the conservation of both the degraded area and the declining medicinal plants and in the long run, ensures sustainability of the area. Moreover, to ensure the sustainability of the conserved area, we engaged segments of the community to benefit from honeybee farming, grasses in fattening sheep through the cut-and-carry system, and in the long run, use of medicinal and wild edible plants will be initiated.

3. Major Achievements

Accelerated Rehabilitation:

The formerly degraded and bare land showed substantial vegetative cover and the return of native flora indicated that soil seed banks had been reactivated. As shown in the figure below, the intervention resulted in notable changes between the baseline and post-implementation phases.

Figure 2: Status of degraded land

Improved Soil Health and Minimized Gully Formation:

The intervention practices implemented so far has led to increased soil micro-biota especially the phosphate solubilizing, ammonia producing bacterial and arbuscular mycorrhizal fungal species. Moreover, the practice has improved soil organic carbon and soil moisture retention and hence minimized the gullies in the lower course.

Improvement in Agricultural Productivity:

Crop yield and soil moisture of the surrounding farmland have dramatically improved and hence productivity of the surrounding farmers has increased by 35% over the past four years as evidenced by the socio-economic impact assessment made in the area. The approach could further assure resilience to climate shocks.

Community Empowerment:

Active participation of the surrounding community reduced the knowledge gap and increased adoption and ownership of conservation practices which guarantees keeping the site sustainable.

Identification and Establishment of Medicinal Plants:

A large number of medicinal plants x have been identified and among which five (*Delonix reticlanata* (Dire Dawa, *Afrocarpus falcatus* (Birbirsa), *Prunus africana* (Muka Gurracha, *Cordia africana* (Wadeessa), and *Hagenia abyysinica* (Koosoo) well-adapting priority species have been established on the site to promote conservation and ensure sustainability.

Return of Wildlife in the Area:

Wildlife species such as Warthog (Karkaro) (*Phcochoerus africanus*), Goda or Bush Hyrax (*Procavia capensis*), Antelop or Midako (*Tragelaphus scriptus*), and others that had previously migrated from the area have begun to return and encroach into the restored landscapes.

4. Major Challenges

Climate Change-related Challenges:

Climate change-driven fluctuation in the rainy season and sometimes total absence in the intended rainy season has posed a significant impact on planting grasses and tree seedlings. The challenge signifies the need of more and coordinated effort at regional, national and international level to offset the effect of climate change.

Lack of Complete Engagement:

A few local communities are still less interested in fully engaging and adopting conservation practices and asume as if conservation contributes less to their productivity though they are evident in the yield varation before and after conservation. In addition, few farmers demand incentives to fully engage in participatory conservation action. Thus, continues and targeted capacity building (training) is still needed to create behavioral change among the community.

5. Policy Recommendations

✍ Scale-up and Strengthen Integrated Community-Based Conservation Approach:

Any integrated and community-based conservation approaches and the best practices need to be strengthened through engaging the local community and establishing institutions. Moreover, the best practices in the approach practiced in a given area need to be scaled up at the district, regional, and country levels. Thus, active participation of the local community, integration of the community benefit with the conserved area such as honey bee farming, sheep and goat fattening, establishing economically important medicinal plants and other activities needs to be scaled up as it increases their trust.

✍ Improve Support Systems for Farmers and Stakeholders:

Participatory conservation approaches and projects should target equipping the local farmers and key stakeholders with technical support, conservation tools, and sustainable practices so that they stand alone and protect their surroundings and elsewhere even after the project is over. In this regard, the trainings, field observations, and practical engagement offered to the local community could be taken as the best lesson.

✍ Partnerships and Collaboration:

Fostering multi-stakeholder and institutional collaborations, such as coordination among governmental organizations, non-governmental organizations, and community-based organizations such as small and micro enterprises and locally established Idir are important for the effective implementation of both integrated and participatory conservation approaches. Enhanced collaboration improves the sustainability and effectiveness of natural resource conservation and related activities.

✍ Active Engagement of Locally Influential Personnel:

Locally recognized religious leaders, *Abba Gada's*, *Hada Sinke's*, and elders are expected to play a vital role in enhancing integrated and participatory conservation. Thus, promoting their active engagement could enhance sustainability and efficiency of the approach/project.

✍ Sustainability Issue:

The sustainability issue of the conserved area needs to be paid attention and the local community should develop a sense of ownership, which is partly attributed to the direct or indirect economic benefit they get. Thus, there should be a means (which is economic, cultural or religious) of sustaining any conservation approaches and achievements.

✍ Building Channel of Effective Communication:

Effective channel of communication on the approach, goal, and outcome of any project should be developed and implemented so as to ensure the active engagement of the local, regional or national governmental bodies as they are partly decision makers and play a critical role in project sustainability.

6. Implementation Strategies

Establishing a Multi-Stakeholder Platform:

Based on the experience obtained as a result of coordinating with sustainable land management (SLM) and other stakeholders, we propose bringing efforts from multi-stakeholders such as farmers, government agencies, researchers, NGOs, and the private sector as an essential tool to facilitate dialogue, knowledge sharing, and joint action in conserving natural resources.

Providing Training and Extension Services:

Delivering targeted training to farmers and stakeholders on sustainable and integrated natural resource conservation practices, climate change-resilient agriculture, and other relevant topics.

Promoting Research and Innovation:

Initiating and supporting research activities and innovations on integrated natural resource conservation approaches, climate change adaptation and mitigation, and sustainable agriculture, and promoting dissemination of the findings to the farmers, policymakers, or the national and international communities.

Establishing a Monitoring and Evaluation System:

Developing a strong system to monitor the practicality, suitability, and sustainability of the adoption of integrated natural resource conservation practices and continuously evaluating their impact on agricultural productivity and farmer livelihoods.

7. Conclusion

The community-led integrated natural resource conservation approaches project offers replicable practices for restoring degraded landscapes and improving smallholder productivity through integrated and participatory approaches. With strong policy support, strategic investments, and community engagement, these practices can be scaled to other agroecological zones across Ethiopia to build climate-resilient agriculture and ensure food security in the near future.

Acknowledgements

We gratefully acknowledge Madda Walabu University for the financial, technical, and logistic support provided throughout the project periods. Special thanks are extended to the Office of the Vice President for Academic, Research, Technology Transfer, and Community Engagement, as well as the Directors and Coordinators of Research, Publication, Ethics, and Community Engagement, whose steadfast support and guidance were instrumental in the successful execution of this work. We also sincerely appreciate the cooperation and assistance of the Goro District Agriculture Office and Cheffe Mana Kebele administration during project activities implementation, fieldwork and data collection. Their contributions greatly enhanced the quality and relevance of this project.

Declaration of Competing Interest

The authors of this review article declare that there is no conflict of interest.

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